NUTSEDGE (*Cyperus* spp.) MANAGEMENT IN CUCURBITS.

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Purple nutsedge (*Cyperus rotundus* L.) and yellow nutsedge (*Cyperus esculentus* L.) were the most troublesome weeds of vegetables in a survey of Georgia county extension agents (Webster and MacDonald unpublished data). A plasticulture system can prevent weed growth, however nutsedges pierce the polyethylene barrier. Harrison and Fery (1998) were concerned that nutsedges will become unmanageable in vegetables after elimination of methyl bromide. Nutsedges rely on vegetative reproduction (i.e. tuber formation) (Thullen and Keeley 1979). Purple nutsedge tubers had a half-life of 16 months and longevity of (99% mortality) 42 months (Neeser et al. 1997). Effective nutsedge management programs must address tuber production and viability. I will briefly review current research on nutsedges, including an evaluation of: 1) the spatial dynamics of nutsedge populations over a growing season, 2) the effect of a combination of temperature and duration of exposure on nutsedge tuber viability, and 3) tolerance of squash and cucumber to halosulfuron, a herbicide with excellent nutsedge efficacy.

While similar in appearance, yellow and purple nutsedge differ greatly in growth habit. Single pre-sprouted yellow and purple nutsedge tubers were planted in a nutsedge-free area and growth monitored at three and six months. After six months of growth, yellow nutsedge averaged 140 shoots/plot and shoots expanded a maximum of 20 cm from the parent tuber. In contrast, purple nutsedge shoots expanded a maximum of 300 cm from the parent tuber and produced an average of 280 shoots/plot. While a greater number of shoots were produced by purple nutsedge, these shoots were spread over a larger area than were yellow nutsedge. Contour maps indicated that maximum purple nutsedge shoot densities were around 200 to 300 shoots/m^2, while yellow nutsedge densities often exceeded 7000 shoots/m^2 (most of the yellow nutsedge shoots were within a 12.7 cm by 12.7 cm quadrat). Each nutsedge shoot was associated with at least one tuber (Willis and Briscoe 1970; personal observation). This study indicates that purple nutsedge tubers can be distributed a significant distance from the parent tuber after just six months of growth, while yellow nutsedge does not spread as far from the parent tuber.

Utilizing elevated temperatures (e.g. solarization, steam, electromagnetic radiation) to eliminate or weaken nutsedge tubers may be a future component of a weed management system that replaces methyl bromide. Purple nutsedge tuber viability decreased in an inverse linear manner over an increasing range of temperatures (30 to 90 C) when exposed for 30 minutes (Rubin and Benjamin 1984). In preliminary studies, yellow nutsedge tubers were more sensitive to high temperatures than were purple nutsedge. Reanalysis of the data from Egley (1990) revealed that median lethal temperatures (temperature required to kill 50% of the population) for eight common weeds seeds at 12 hours of exposure were 50 to 66 C. In comparison, our studies indicated that pre-sprouted yellow nutsedge tubers exposed to 50 C for as few as 30 minutes, resulted in greater than 80% tuber mortality. However, yellow nutsedge tubers exposed to 45 C for

8 hours resulted in less than 5% tuber mortality. In a plasticulture system in southern Louisiana greater than 60% of the days exceeded each of the following: 50 C at a depth of 10 cm, 55 C at 5 cm, and 60 C at the soil surface (Arora and Yaduraju 1998). Knowledge of the relation among tuber mortality, temperature, and duration of exposure may allow for the development of systems that influence tuber viability.

Halosulfuron effectively controls nutsedges and has potential for use in many vegetable crops. Halosulfuron reduced purple nutsedge tuber populations 35 to 50 % when applied in consecutive years (Webster and Coble 1997). Halosulfuron controls the tuber attached to sprayed foliage (Molin et al. 1997), whereas many other herbicides will only kill the foliage and permit the tuber to regrow. A greenhouse study was conducted to determine the relative susceptibility of direct seeded and transplant cucurbits (six squash and six cucumber cultivars) to preemergence and postemergence appliations of halosulfuron. An inverse relation between crop biomass and increasing rates of halosulfuron existed for both direct-seeded and transplanted cucurbits. Transplanted squash had the greatest injury averaged over all rates of halosulfuron, with a plant biomass 60% of the nontreated control. Transplanted cucumbers were the most tolerant of halosulfuron with a plant biomass 94% of the nontreated control. Visual crop injury rating indicated that cucumber was more tolerant to halosulfuron than squash. Visual rating of cucumber injury increased with halosulfuron rate for direct seeded plants (up to 22% injury), while injury on transplants were independent of halosulfuron rate. Injury to direct-seeded squash treatments that included a preemergence application increased with halosulfuron rate with maximum injury $\geq$33% at 53 g ai/ha halosulfuron. Postemergence applications to direct-seeded squash and all applications to transplanted squash had more subtle crop injury ranging from 12 to19%. This demonstrates that while there is some variability in halosulfuron tolerance among the tested cucurbit cultivars, halosulfuron may be a viable alternative to methyl bromide for control of nutsedges in a plasticulture system.

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